



02356.0086 SEQUENCE LISTING
SEQUENCE LISTING

<110> Institut Pasteur

<120> PLASMODIUM FALCIPARUM ANTIGENS AND VACCINE AND DIAGNOSTIC USES THEREOF

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<150> CA 2,345,206

<151> 2001-05-16

<150> CA 2,346,968

<151> 2001-05-23

<160> 18

<170> PatentIn version 3.1

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<212> DNA

<213> Plasmodium falciparum

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agagaagatc ctattgcttc tgaaactgaa gttgtaagtg aacctgagga ttcaagtagg 180
ataatgacta cagaagttcc aagtactact gtaaaacccc ctgatgaaaa acgatctgaa 240
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Thr Glu Val Val Ser Glu Pro Glu Asp Ser Ser Arg Ile Met Thr Thr
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Glu Val Pro Ser Thr Thr Val Lys Pro Pro Asp Glu Lys Arg Ser Glu
65 70 75 80

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Pro Pro Lys Glu Phe
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Asp Trp Ile Asn Gln Ile Phe Lys Lys Asn Ser Leu Gln Cys Asp Leu
20 25 30tat ttt ttg gat gac aac aaa gaa aaa gat gtt agt aag aaa aga aaa 144
Tyr Phe Leu Asp Asp Asn Lys Glu Lys Asp Val Ser Lys Lys Arg Lys
35 40 45gct caa ttg aag gat gaa tat gat aat ata tca agg agc aaa gaa aat 192
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gat Asp	att Ile	tat Tyr	aaa Lys	agt Ser 165	aat Asn	aaa Lys	aaa Lys	aat Asn	gtt Val 170	cct Pro	gat Asp	aat Asn	tgc Cys	cat His 175	ata Ile	528
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aat Asn	aat Asn	ata Ile 195	agg Arg	aac Asn	ata Ile	cat His	aat Asn 200	gat Asp	aac Asn	tca Ser	tct Ser	tca Ser 205	tgc Cys	gat Asp	ata Ile	624
tcc Ser	gat Asp 210	ata Ile	aaa Lys	agt Ser	gaa Glu	gat Asp 215	gaa Glu	tat Tyr	ata Ile	gaa Glu	cca Pro 220	tat Tyr	gaa Glu	aaa Lys	aag Lys	672
aat Asn 225	gaa Glu	gaa Glu	aat Asn	ata Ile	aat Asn 230	gaa Glu	tat Tyr	aag Lys	aat Asn	aag Lys 235	aaa Lys	aat Asn	ata Ile	gcc Ala	aat Asn 240	720
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aac Asn	aaa Lys	ata Ile 275	agt Ser	agt Ser	cat His	aat Asn	aat Asn 280	att Ile	gat Asp	aat Asn	aat Asn	atg Met 285	gat Asp	aat Asn	tat Tyr	864
aat Asn	acg Thr 290	ttt Phe	gca Ala	aat Asn	gtg Val	aat Asn 295	aat Asn	ttt Phe	ata Ile	ata Ile	tat Tyr 300	tcc Ser	tca Ser	gat Asp	gat Asp	912
gaa Glu	gat Asp	aat Asn	ata Ile	tca Ser	aat Asn	tat Tyr	tat Tyr	aat Asn	ggt Gly	aaa Lys	gac Asp	gta Val	tta Leu	aat Asn	gat Asp	960

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aat aaa aat cca agt gaa aaa agt gtt ttt atg aat gat gaa tct act					1104
Asn Lys Asn 355		Pro Ser Glu Lys Ser 360		Val Phe Met Asn Asp 365	
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Gly Tyr Leu Lys Asn Asp Val 375		Asn Asp Lys Cys Val 380		Val Val Asp Asn Ile	
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Asn Val Ile Asn Pro Ser Ser Val 390		Asn Thr Leu Ser Asn Ile Ser 400		Asn 400	
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Ile Arg Asn Glu Lys 405		Ile Glu Asn Asn Asn Lys Asn Glu Lys 415		Leu Ile 415	
aaa tca tat cct aca caa tca aaa aat gtt atg agt aca ttt tcc ttt					1296
Lys Ser Tyr Pro 420		Thr Gln Ser Lys Asn 425		Val Met Ser Thr Phe 430	
tgg aat att gaa aag gag aca ttt ata aca aaa cct ttg tat gca caa					1344
Trp Asn Ile 435		Glu Lys Glu Thr Phe 440		Ile Thr Lys Pro Leu Tyr Ala Gln 445	
aat ttg aga aaa aaa caa ttt agt tta tta gat gaa tct gaa gag atg					1392
Asn Leu Arg Lys Lys Gln Phe 455		Ser Leu Leu Asp Glu Ser Glu Glu Met 460			
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Ile Arg Asn Tyr Ser Ser Asn Gln Tyr Ser Ile Lys Phe Val Pro Arg 480		Ile 475			
cat tta tta tat gta atg agt caa gtt gct tct cga tcc ttt ttt gat					1488
His Leu Leu Tyr Val 485		Met Ser Gln Val Ala Ser Arg Ser Phe Phe 495		Asp 495	
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 Tyr Phe Leu Asp Asp Asn Lys Glu Lys Asp Val Ser Lys Lys Arg Lys
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 Ala Gln Leu Lys Asp Glu Tyr Asp Asn Ile Ser Arg Ser Lys Glu Asn
 50 55 60
 Ile Asn Asn Ser Lys Lys Ile Lys Asn Glu Leu Ser Ile Lys Asp Asn
 65 70 75 80
 Met His Asp Tyr Ile Tyr Asp Asp Arg Ile Tyr Asn Asn Asp Lys Glu
 85 90 95
 Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn
 100 105 110
 Lys Asn Asp Tyr Lys Lys Cys Asn Lys Asn Val Ile Lys Ser Asp Asn
 115 120 125
 Lys Asn Val Ile Lys Ser Asp Asn Lys Asn Val Ile Lys Ser Asp Asn
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 Lys Asn Val Ile Lys Ser Asp Tyr Lys Ser Asp Asp Arg Asn Ala Cys
 145 150 155 160
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 Tyr Asp Asp Asn Ser Ser Val Glu Asn Leu Asp Gly Lys Asn Lys Leu
 180 185 190
 Asn Asn Ile Arg Asn Ile His Asn Asp Asn Ser Ser Ser Cys Asp Ile
 195 200 205
 Ser Asp Ile Lys Ser Glu Asp Glu Tyr Ile Glu Pro Tyr Glu Lys Lys
 210 215 220
 Asn Glu Glu Asn Ile Asn Glu Tyr Lys Asn Lys Lys Asn Ile Ala Asn
 225 230 235 240
 Glu Asn Ile Lys Glu Gly Lys Ser Ser Ile Tyr Asn Asp Glu His Asn
 245 250 255

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Tyr Asn Ser Leu Leu Tyr Asn Ser Cys Asn Gly Glu Ile Ser Lys Ile
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 275 280 285
 Asn Thr Phe Ala Asn Val Asn Asn Phe Ile Ile Tyr Ser Ser Asp Asp
 290 295 300
 Glu Asp Asn Ile Ser Asn Tyr Tyr Asn Gly Lys Asp Val Leu Asn Asp
 305 310 315 320
 Glu Ile Met Phe Pro Ile Lys Phe Asn Phe Glu Lys Leu Lys Lys Asn
 325 330 335
 Ile Tyr Val Ile Glu His Ile Asp Lys Ile Tyr Tyr Asp Thr Phe Leu
 340 345 350
 Asn Lys Asn Pro Ser Glu Lys Ser Val Phe Met Asn Asp Glu Ser Thr
 355 360 365
 Gly Tyr Leu Lys Asn Asp Val Asn Asp Lys Cys Val Val Asp Asn Ile
 370 375 380
 Asn Val Ile Asn Pro Ser Ser Val Asn Thr Leu Ser Asn Ile Ser Asn
 385 390 395 400
 Ile Arg Asn Glu Lys Ile Glu Asn Asn Asn Lys Asn Glu Lys Leu Ile
 405 410 415
 Lys Ser Tyr Pro Thr Gln Ser Lys Asn Val Met Ser Thr Phe Ser Phe
 420 425 430
 Trp Asn Ile Glu Lys Glu Thr Phe Ile Thr Lys Pro Leu Tyr Ala Gln
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 Asn Leu Arg Lys Lys Gln Phe Ser Leu Leu Asp Glu Ser Glu Glu Met
 450 455 460
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 465 470 475 480
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Tyr Val Val Leu Cys Thr Tyr Val Leu Gly Ile Ser Glu Glu Tyr Leu		
20 25 30		
aag gaa agg ccc caa ggt tta aat gtt gag act aat aat aat aat aat		144
Lys Glu Arg Pro Gln Gly Leu Asn Val Glu Thr Asn Asn Asn Asn Asn		

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aaa aaa gtg aag ata ata tct aga cct gtt gag aat aca tta cat aga Lys Lys Val Lys Ile Ile Ser Arg Pro Val Glu Asn Thr Leu His Arg 85 90 95			288
tat cca gtt agt tct ttt ctg aat atc aaa aag tat ggt agg aaa ggg Tyr Pro Val Ser Ser Phe Leu Asn Ile Lys Lys Tyr Gly Arg Lys Gly 100 105 110			336
gaa tat ttg aat aga aat agt ttt gtt caa aga tca tat ata agg ggt Glu Tyr Leu Asn Arg Asn Ser Phe Val Gln Arg Ser Tyr Ile Arg Gly 115 120 125			384
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Arg	Gln	Arg	Tyr	Glu	Val	Ser	Ile	Leu	Gly	Lys	Lys	Tyr	Ile	Lys	Val	
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gta	cga	tat	act	ata	ttt	agg	aga	aaa	ata	gtt	caa	cct	gat	aat	gct	1104
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Leu	Asp	Phe	Leu	Lys	Leu	Asn	Cys	Ser	Glu	Cys	Lys	Asp	Ile	Asp	Phe	
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Cys	Gln	Ser	Tyr	Ile	Asp	Leu	Lys	Ile	Gln	Phe	Lys	Asn	Asn	Asp	Ile	
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tgt	tca	ttt	aat	gct	caa	aca	gat	act	gtt	tct	agc	gat	aaa	aga	ttt	1296
Cys	Ser	Phe	Asn	Ala	Gln	Thr	Asp	Thr	Val	Ser	Ser	Asp	Lys	Arg	Phe	
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Cys	Leu	Glu	Lys	Lys	Glu	Phe	Lys	Pro	Trp	Lys	Cys	Asp	Lys	Asn	Ser	
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Phe	Glu	Thr	Val	His	His	Lys	Gly	Val	Cys	Val	Ser	Pro	Arg	Arg	Gln	
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aat	gta	cat	aat	tca	caa	cta	ctt	atc	gaa	att	ata	atg	gct	tct	aaa	1488
Asn	Val	His	Asn	Ser	Gln	Leu	Leu	Ile	Glu	Ile	Ile	Met	Ala	Ser	Lys	
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Gln	Glu	Gly	Lys	Leu	Leu	Trp	Lys	Lys	His	Gly	Thr	Ile	Leu	Asp	Asn	
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cag	aat	gca	tgc	aaa	tat	ata	aat	gat	agt	tat	gtt	gat	tat	aaa	gat	1584
Gln	Asn	Ala	Cys	Lys	Tyr	Ile	Asn	Asp	Ser	Tyr	Val	Asp	Tyr	Lys	Asp	
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ata	gtt	att	gga	aat	gat	tta	tgg	aat	gat	aac	aac	tct	ata	aaa	gtt	1632
Ile	Val	Ile	Gly	Asn	Asp	Leu	Trp	Asn	Asp	Asn	Asn	Ser	Ile	Lys	Val	
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gac Asp	gaa Glu	gta Val 595	gat Asp	caa Gln	cgt Arg	aga Arg	aaa Lys 600	act Thr	tgt Cys	gaa Glu	aga Arg	ata Ile 605	gat Asp	gaa Glu	cta Leu	1824
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aca Thr	ggt Gly	aat Asn	aat Asn	gga Gly 645	aaa Lys	tcc Ser	tta Leu	tgt Cys	cag Gln 650	gat Asp	aaa Lys	aca Thr	tgt Cys	caa Gln 655	aat Asn	1968
gtg Val	tgt Cys	act Thr	aat Asn 660	atg Met	aat Asn	tat Tyr	tgg Trp	aca Thr 665	tat Tyr	act Thr	aga Arg	aaa Lys	tta Leu 670	gct Ala	tat Tyr	2016
gaa Glu	ata Ile	caa Gln 675	tcc Ser	gta Val	aaa Lys	tat Tyr	gat Asp 680	aaa Lys	gat Asp	aga Arg	aaa Lys	tta Leu 685	ttt Phe	agt Ser	ctt Leu	2064
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gtg Val	agt Ser 770	gtc Val	gca Ala	agt Ser	ggt Gly	aat Asn 775	aaa Lys	gaa Glu	atc Ile	gaa Glu	aag Lys 780	agt Ser	aag Lys	gat Asp	gaa Glu	2352
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02356.0086 SEQUENCE LISTING

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gat aca aaa aat tca cct gaa aat tta aaa gta cag gaa cat gga aca	2496
Asp Thr Lys Asn Ser Pro Glu Asn Leu Lys Val Gln Glu His Gly Thr	
820 825 830	
aat gga gaa aca ata aaa gaa gaa cca cca aaa tta cct gaa tca tct	2544
Asn Gly Glu Thr Ile Lys Glu Glu Pro Pro Lys Leu Pro Glu Ser Ser	
835 840 845	
gaa aca tta caa tca caa gaa caa tta gaa gca gaa gca caa aaa caa	2592
Glu Thr Leu Gln Ser Gln Glu Gln Leu Glu Ala Glu Ala Gln Lys Gln	
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Lys Gln Glu Glu Glu Pro Lys Lys Lys Gln Glu Glu Glu Pro Lys Lys	
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aaa caa gaa gaa gaa caa aaa cga gaa caa gaa caa aaa caa gaa caa	2688
Lys Gln Glu Glu Glu Gln Lys Arg Glu Gln Glu Gln Lys Gln Glu Gln	
885 890 895	
gaa gaa gaa gaa caa aaa caa gaa gaa gaa caa caa ata caa gat caa	2736
Glu Glu Glu Glu Gln Lys Gln Glu Glu Glu Gln Gln Ile Gln Asp Gln	
900 905 910	
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Ser Gln Ser Gly Leu Asp Gln Ser Ser Lys Val Gly Val Ala Ser Glu	
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Gln Asn Glu Ile Ser Ser Gly Gln Glu Gln Asn Val Lys Ser Ser Ser	
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Pro Glu Val Val Pro Gln Glu Thr Thr Ser Glu Asn Gly Ser Ser Gln	
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Asp Thr Lys Ile Ser Ser Thr Glu Pro Asn Glu Asn Ser Val Val Asp	
965 970 975	
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Arg Ala Thr Asp Ser Met Asn Leu Asp Pro Glu Lys Val His Asn Glu	
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Asn Met Ser Asp Pro Asn Thr Asn Thr Glu Pro Asp Ala Ser Leu Lys	
995 1000 1005	
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Asp Asp Lys Lys Glu Val Asp Asp Ala Lys Lys Glu Leu Gln Ser	
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1070	1075	1080	
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1085	1090	1095	
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1100	1105	1110	
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Gly Glu	Met Thr Glu Gly	Ser	Glu Ser Asp Val	Gly	Glu Leu Gln	
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Gln Ile	Ala Ser Asp Arg	Glu	Lys Glu Glu Ile	Gln	Lys Leu Leu	
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Thr Glu	Asp Ser Met Ser	Asp	Gly Val Asn Ser	His	Leu Tyr Tyr	
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Asp Ala	Ser Lys Asp Arg	Glu	Glu Ile Leu Asn	Arg	Ser Asn Thr	
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Asn Thr	Cys Ser Asn Glu	His	Ser Leu Lys Tyr	Cys	Gln Tyr Met	
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Glu Arg	Asn Lys Asp Leu	Leu	Glu Thr Cys Ser	Glu	Asp Lys Arg	
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Leu His	Leu Cys Cys Glu	Ile	Ser Asp Tyr Cys	Leu	Lys Phe Phe	
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Asn Pro	Lys Ser Ile Glu	Tyr	Phe Asp Cys Thr	Gln	Lys Glu Phe	
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gat gac	cct aca tat aat	tgt	ttt aga aaa caa	aga	ttt aca agt	4464
Asp Asp	Pro Thr Tyr Asn	Cys	Phe Arg Lys Gln	Arg	Phe Thr Ser	
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			Met His	Tyr Ile Ala Gly Gly		
			1490		1495	
ggt ata ata gcc ctt tta ttg ttt att tta ggt tca gcc agc tat						4622
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                Asp  Asp Glu Lys Gly Phe  Tyr Asp Ser Asn Leu
                1515                1520                1525

aat gat tct gct ttt  gaa tat aat aat aat  aaa tat aat aaa tta      4828
Asn Asp Ser Ala Phe  Glu Tyr Asn Asn Asn  Lys Tyr Asn Lys Leu
                1530                1535                1540

cct tat atg tgtaaggaaa aaactaaaaa acaaaaaaaaa aaaaaaatat      4877
Pro Tyr Met

atatatatat atatatatat acggatgcat ttccacattc ctattatttc ttattcttat      4937

aatttttatt atttatttat ttattttttt ttttc gta gtt  gat caa caa ata      4990
                        Val Val  Asp Gln Gln Ile
                        1545

aat  gta gta aat tct gat  tta tat tcg gag ggt  att tat gat gac      5035
Asn  Val Val Asn Ser Asp  Leu Tyr Ser Glu Gly  Ile Tyr Asp Asp
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Thr  Thr Thr Phe
1565

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Lys Glu Arg Pro Gln Gly Leu Asn Val Glu Thr Asn Asn Asn Asn
35      40      45

Asn Asn Asn Asn Asn Asn Ser Asn Ser Asn Asp Ala Met Ser Phe Val
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 100 105 110
 Glu Tyr Leu Asn Arg Asn Ser Phe Val Gln Arg Ser Tyr Ile Arg Gly
 115 120 125
 Cys Lys Gly Lys Arg Ser Thr His Thr Trp Ile Cys Glu Asn Lys Gly
 130 135 140
 Asn Asn Asn Ile Cys Ile Pro Asp Arg Arg Val Gln Leu Cys Ile Thr
 145 150 155 160
 Ala Leu Gln Asp Leu Lys Asn Ser Gly Ser Glu Thr Thr Asp Arg Lys
 165 170 175
 Leu Leu Arg Asp Lys Val Phe Asp Ser Ala Met Tyr Glu Thr Asp Leu
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 Leu Trp Asn Lys Tyr Gly Phe Arg Gly Phe Asp Asp Phe Cys Asp Asp
 195 200 205
 Val Lys Asn Ser Tyr Leu Asp Tyr Lys Asp Val Ile Phe Gly Thr Asp
 210 215 220
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 225 230 235 240
 Phe Phe Lys Lys Asp Ser Ser Val Leu Asn Pro Thr Ala Trp Trp Arg
 245 250 255
 Arg Tyr Gly Thr Arg Leu Trp Lys Thr Met Ile Gln Pro Tyr Ala His
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 Leu Gly Cys Arg Lys Pro Asp Glu Asn Glu Pro Gln Ile Asn Arg Trp
 275 280 285
 Ile Leu Glu Trp Gly Lys Tyr Asn Cys Arg Leu Met Lys Glu Lys Glu
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 Lys Leu Leu Thr Gly Glu Cys Ser Val Asn Arg Lys Lys Ser Asp Cys
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02356.0086 SEQUENCE LISTING

Ser Thr Gly Cys Asn Asn Glu Cys Tyr Thr Tyr Arg Ser Leu Ile Asn
325 330 335

Arg Gln Arg Tyr Glu Val Ser Ile Leu Gly Lys Lys Tyr Ile Lys Val
340 345 350

Val Arg Tyr Thr Ile Phe Arg Arg Lys Ile Val Gln Pro Asp Asn Ala
355 360 365

Leu Asp Phe Leu Lys Leu Asn Cys Ser Glu Cys Lys Asp Ile Asp Phe
370 375 380

Lys Pro Phe Phe Glu Phe Glu Tyr Gly Lys Tyr Glu Glu Lys Cys Met
385 390 395 400

Cys Gln Ser Tyr Ile Asp Leu Lys Ile Gln Phe Lys Asn Asn Asp Ile
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Cys Ser Phe Asn Ala Gln Thr Asp Thr Val Ser Ser Asp Lys Arg Phe
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Cys Leu Glu Lys Lys Glu Phe Lys Pro Trp Lys Cys Asp Lys Asn Ser
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Gly Phe Cys Leu Gly Asn Leu Asn Tyr Leu Leu Asn Asp Asp Ile Tyr
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500 505 510

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02356.0086 SEQUENCE LISTING

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 625 630 635 640
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 690 695 700
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 Asp Thr Lys Asn Ser Pro Glu Asn Leu Lys Val Gln Glu His Gly Thr
 Page 19

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825

830

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850 855 860

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Lys Gln Glu Glu Glu Gln Lys Arg Glu Gln Glu Gln Lys Gln Glu Gln
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930 935 940

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02356.0086 SEQUENCE LISTING

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02356.0086 SEQUENCE LISTING

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 Leu His Leu Cys Cys Glu Ile Ser Asp Tyr Cys Leu Lys Phe Phe
 1445 1450 1455
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 1460 1465 1470
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 1475 1480 1485
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